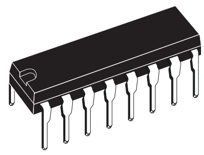
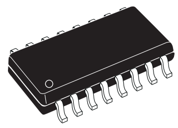
ULQ2001A - ULQ2003A
ULQ2002A - ULQ2004A

SEVEN DARLINGTON ARRAYS

- SEVEN DARLINGTONS PER PACKAGE
- **EXTENDED TEMPERATURE RANGE (–40 to 105°C)**
- OUTPUT CURRENT 500 mA PER DRIVER (600 mA PEAK)
- OUTPUT VOLTAGE 50 V
- INTEGRAL SUPPRESSION DIODES FOR INDUCTIVE LOADS
- OUTPUTS CAN BE PARALLELED FOR HIGHER CURRENT
- TTL/CMOS/PMOS/DTL COMPATIBLE INPUTS
- INPUTS PINNED OPPOSITE OUTPUTS TO SIMPLIFY LAYOUT



DIP16



SO16

ORDERING NUMBERS:

ULQ2001A/2A/3A/4A (DIP16)
ULQ2001D1/2D1/3D1/4D1 (SO16)

DESCRIPTION

The ULQ2001A, ULQ2002A, ULQ2003 and ULQ2004A are high voltage, high current darlington arrays each containing seven open collector darlington pairs with common emitters. Each channel is rated at 500 mA and can withstand peak currents of 600 mA. Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout.

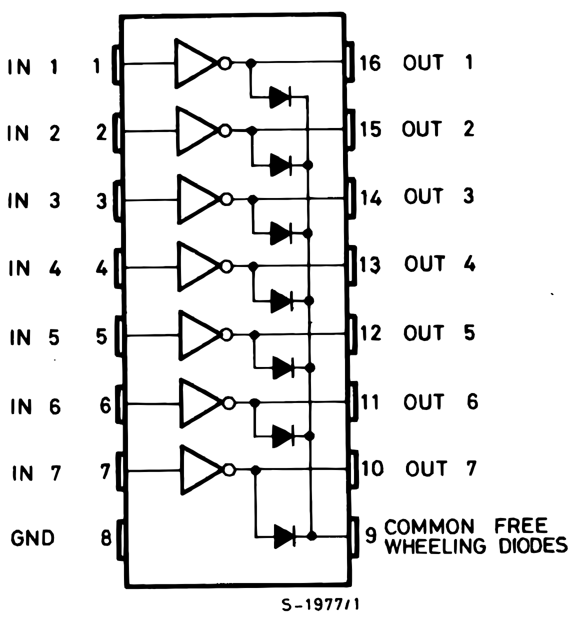
The four versions interface to all common logic families :

ULQ2001A	General Purpose, DTL, TTL, PMOS, CMOS
ULQ2002A	14-25V PMOS
ULQ2003A	5V TTL, CMOS
ULQ2004A	6-15V CMOS, PMOS

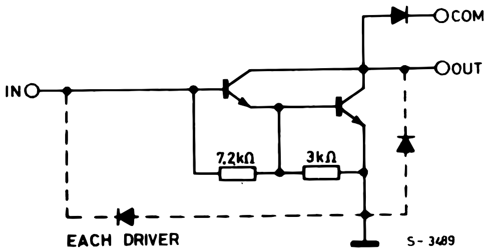
These versatile devices are useful for driving a wide range of loads including solenoids, relays DC motors, LED displays filament lamps, thermal printheads and high power buffers.

The ULQ2001A/2002A/2003A and 2004A are supplied in 16 pin plastic DIP packages with a copper leadframe to reduce thermal resistance. They are available also in small outline package (SO-16) as ULQ2001D1/2002D1/2003D1/2004D1.

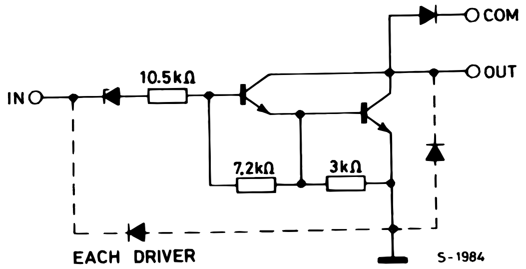
PIN CONNECTION



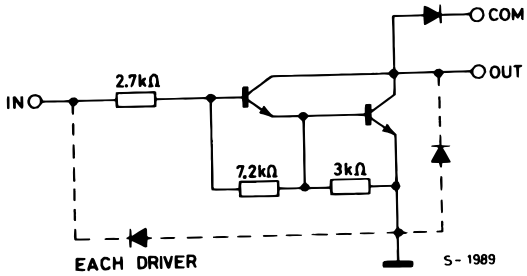
SCHEMATIC DIAGRAM



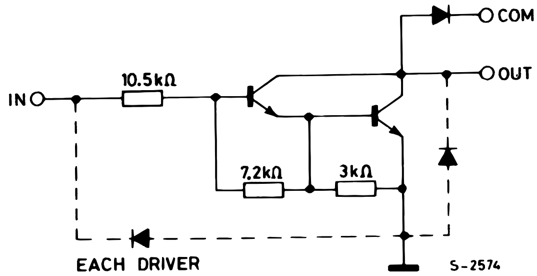
Series ULQ-2001A
(each driver)



Series ULQ-2002A
(each driver)



Series ULQ-2003A
(each driver)



Series ULQ-2004A
(each driver)

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_o	Output Voltage	50	V
V_{in}	Input Voltage (for ULQ2002A/D1 - 2003A/D1 - 2004A/D1)	30	V
I_c	Continuous Colletor Current	500	mA
I_b	Continuous Base Current	25	mA
Tamb	Operating Ambient Temperature Range	–40 to 105	°C
T_{stg}	Storage Temperature Range	–55 to 150	°C
T_j	Junction Temperature	150	°C

THERMAL DATA

Symbol	Parameter		DIP16	SO16	Unit
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max.	70	120	°C/W

ELECTRICAL CHARACTERISTICS (T_J = –40 to 105°C for DIP16 unless otherwise specified)
(T_J = 25 to 105°C for SO16 unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
I_{CEX}	Output Leakage Current	V_{CE} = 50V T_J = 105°C, V_{CE} = 50V T_J = 105°C for **ULQ2002A** V_{CE} = 50V, V_i = 6V for **ULQ2004A** V_{CE} = 50V, V_i = 1V			50 100 500 500	µA µA µA µA	1a 1a 1b 1b
$V_{CE(sat)}$	Collector-emitter Saturation Voltage	I_C = 100mA, I_B = 250µA I_C = 200mA, I_B = 350µA I_C = 350mA, I_B = 500µA		0.9 1.1 1.3	1.1 1.3 1.6	V V V	2 2 2
$I_{i(on)}$	Input Current	for **ULQ2002A** V_i = 17V for **ULQ2003A** V_i = 3.85V for **ULQ2004A** V_i = 5V V_i = 12V		0.82 0.93 0.35 1	1.25 1.35 0.5 1.45	mA mA mA mA	3 3 3 3
$I_{i(off)}$	Input Current	T_J = 105°C, I_C = 500µA	50	65		µA	4
$V_{i(on)}$	Input Voltage	for **ULQ2002A** V_{CE} = 2V, I_C = 300mA for **ULQ2003A** V_{CE} = 2V, I_C = 200mA V_{CE} = 2V, I_C = 250mA V_{CE} = 2V, I_C = 300mA for **ULQ2004A** V_{CE} = 2V, I_C = 125mA V_{CE} = 2V, I_C = 200mA V_{CE} = 2V, I_C = 275mA V_{CE} = 2V, I_C = 350mA			13 2.4 2.7 3 5 6 7 8	V V V V V V V V	5 5 5 5 5 5 5 5
h_{FE}	DC Forward Current Gain	for **ULQ2001A** V_{CE} = 2V, I_C = 350mA	1000			–	2
C_i	Input Capacitance			15	25 (*)	pF	–
t_{PLH}	Turn-on Delay Time	0.5 V_i to 0.5 V_o		0.25	1 (*)	µs	–
t_{PHL}	Turn-off Delay Time	0.5 V_i to 0.5 V_o		0.25	1 (*)	µs	–
I_R	Clamp Diode Leakage Current	V_R = 50V T_J = 105°C, V_R = 50V			50 100	µA µA	6 6
V_F	Clamp Diode Forward Voltage	I_F = 350mA		1.7	2	V	7

(*) Guaranteed by design

TEST CIRCUITS

Figure 1a.

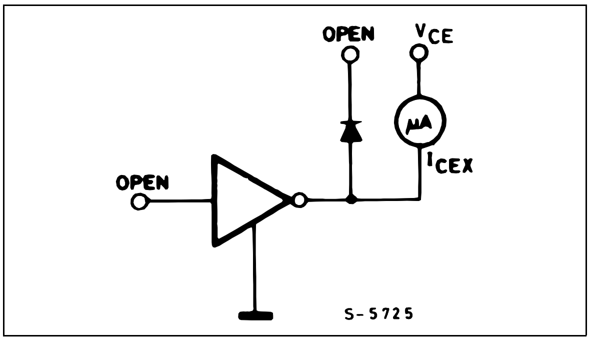


Figure 1b.

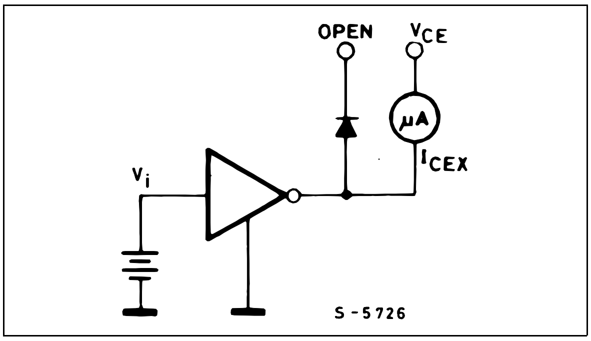


Figure 2.

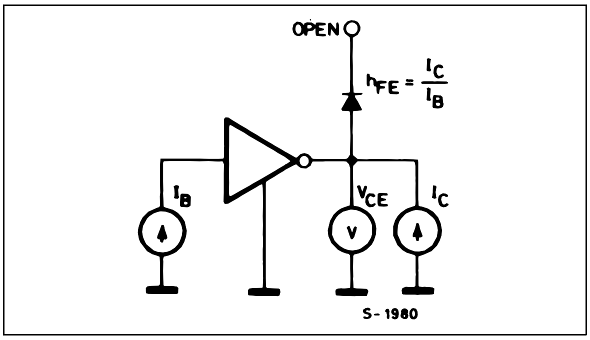


Figure 3.

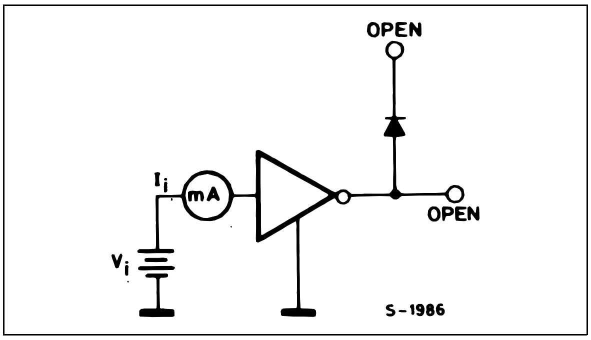


Figure 4.

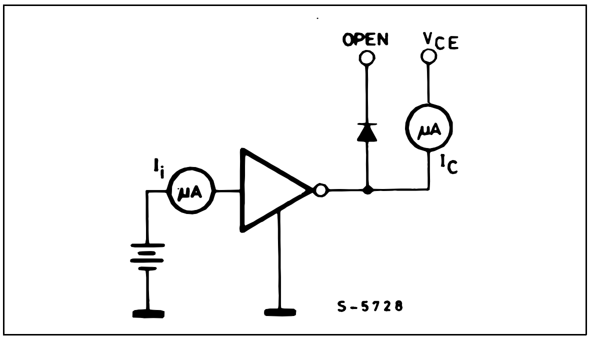


Figure 5.

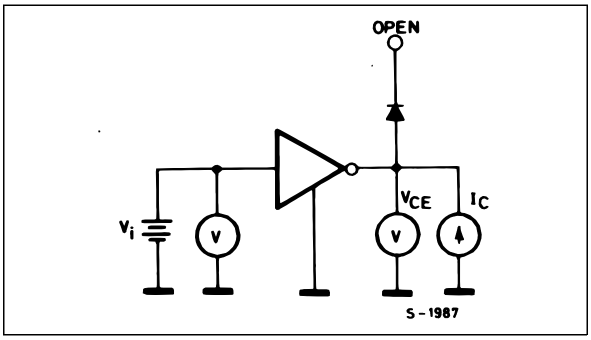


Figure 6.

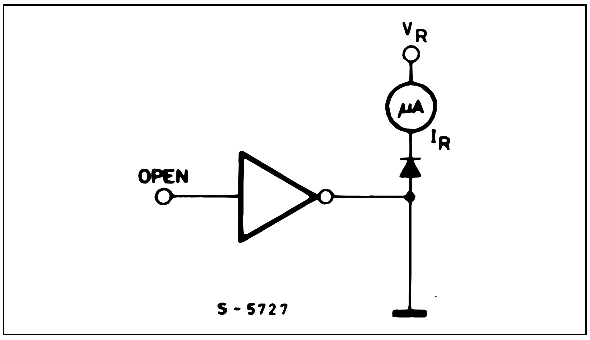
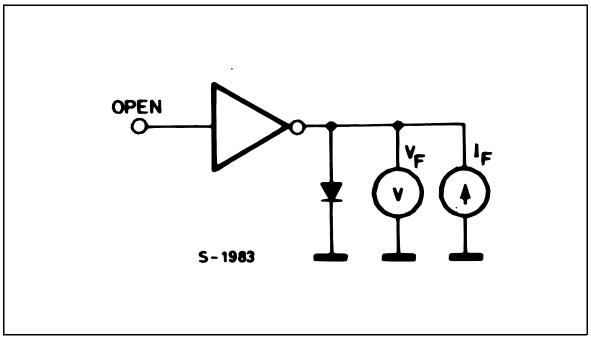
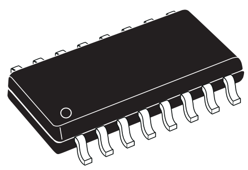


Figure 7.



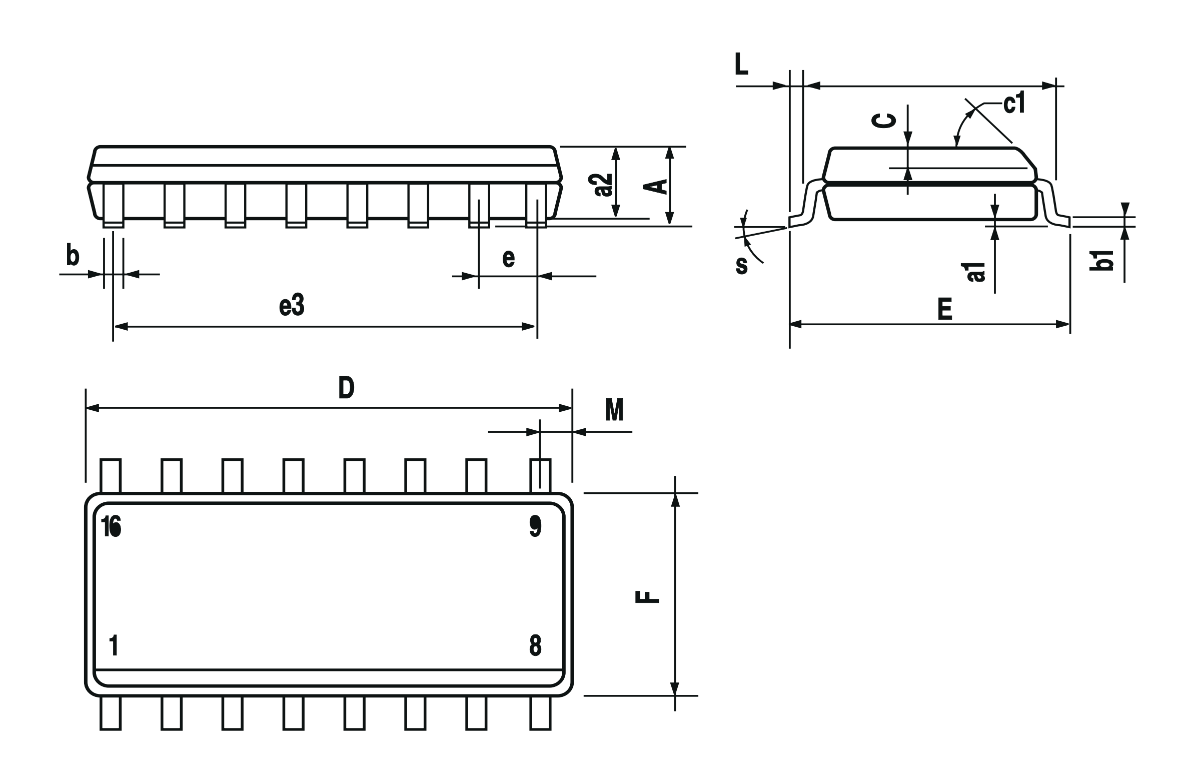
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.069
a1	0.1		0.25	0.004		0.009
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D (1)	9.8		10	0.386		0.394
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F (1)	3.8		4	0.150		0.157
G	4.6		5.3	0.181		0.209
L	0.4		1.27	0.016		0.050
M			0.62			0.024
S	8°(max.)					

OUTLINE AND MECHANICAL DATA



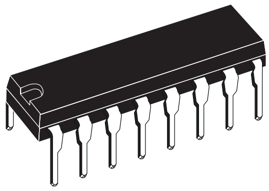
SO16 Narrow

(1) D and F do not include mold flash or protrusions. Mold flash or potrusions shall not exceed 0.15mm (.006inch).



DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050

OUTLINE AND MECHANICAL DATA



DIP16

